Tittabawassee River, Saginaw River & Bay Site

Segment 1
Developing Cleanup Options

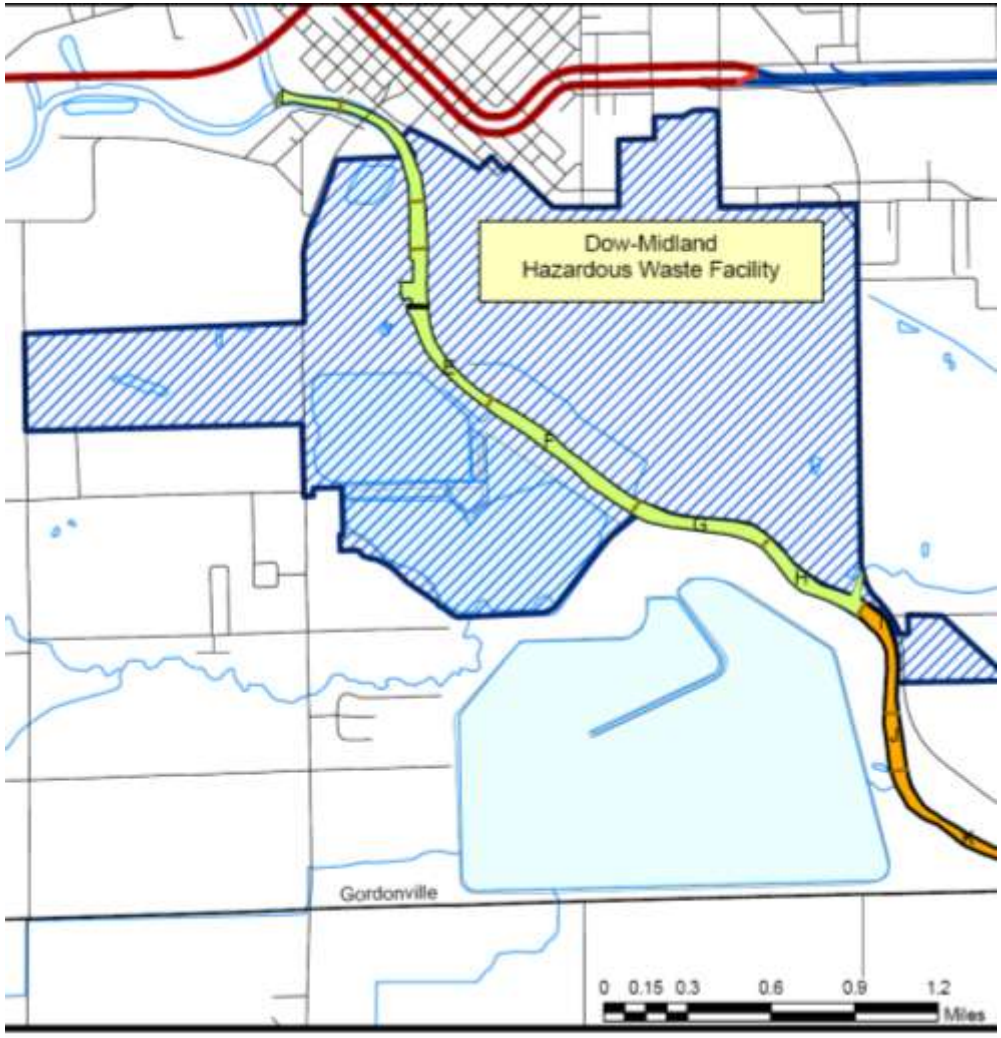
CAG Meeting May 16, 2011

Agenda

- Brief Summary of Segment 1 Conditions
- Sediment Cleanup Options
  - Sediment Management Areas (SMAs)

Segment 1 Overview

- Three miles next to Dow's Midland plant
- Some cleanup has already occurred
- Unique conditions in this segment
- Cleanup options proposed in 2011
- Cleanup expected to begin in 2012



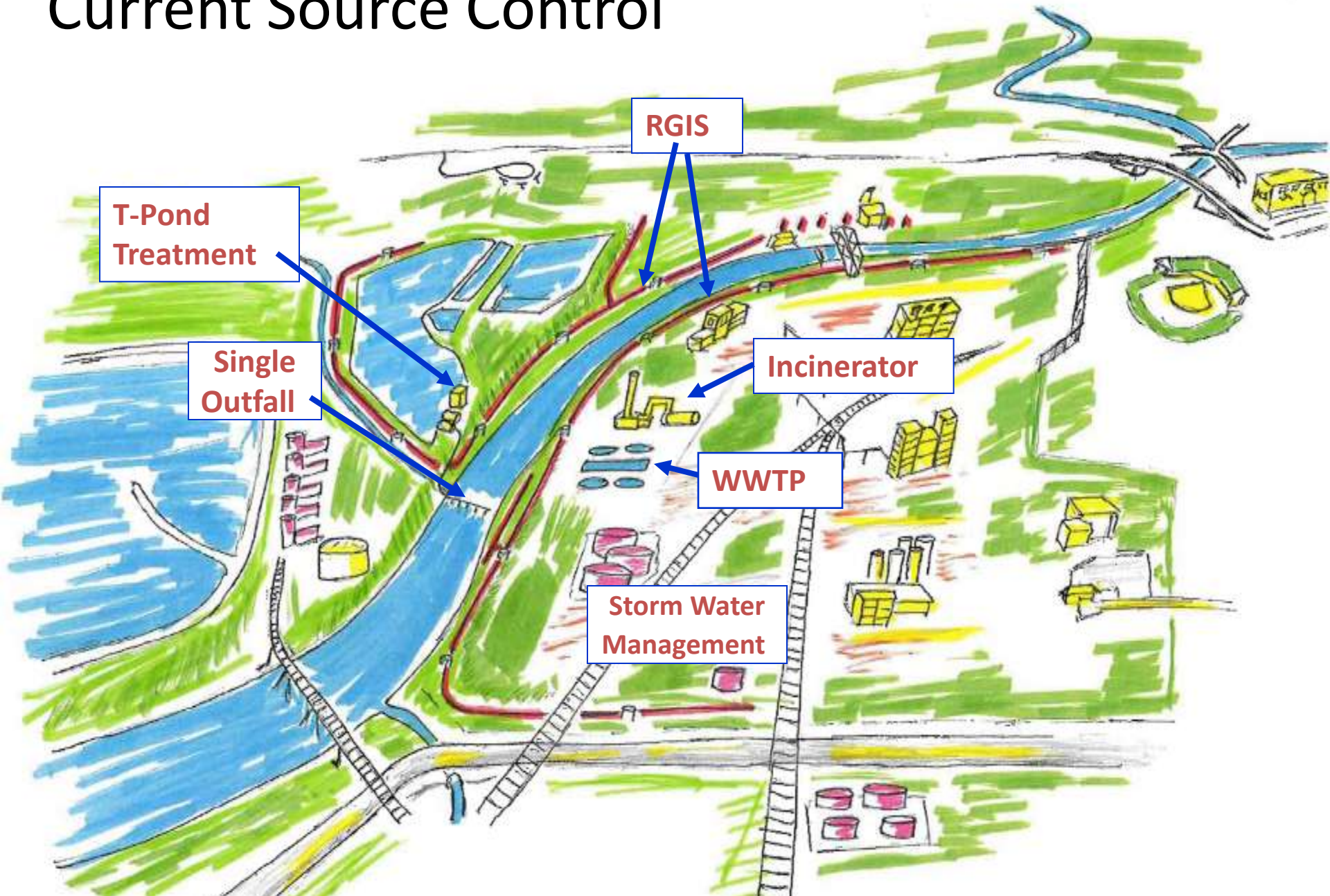
Segment 1 Boundary

Summary of Segment Conditions

Site History & Source Control

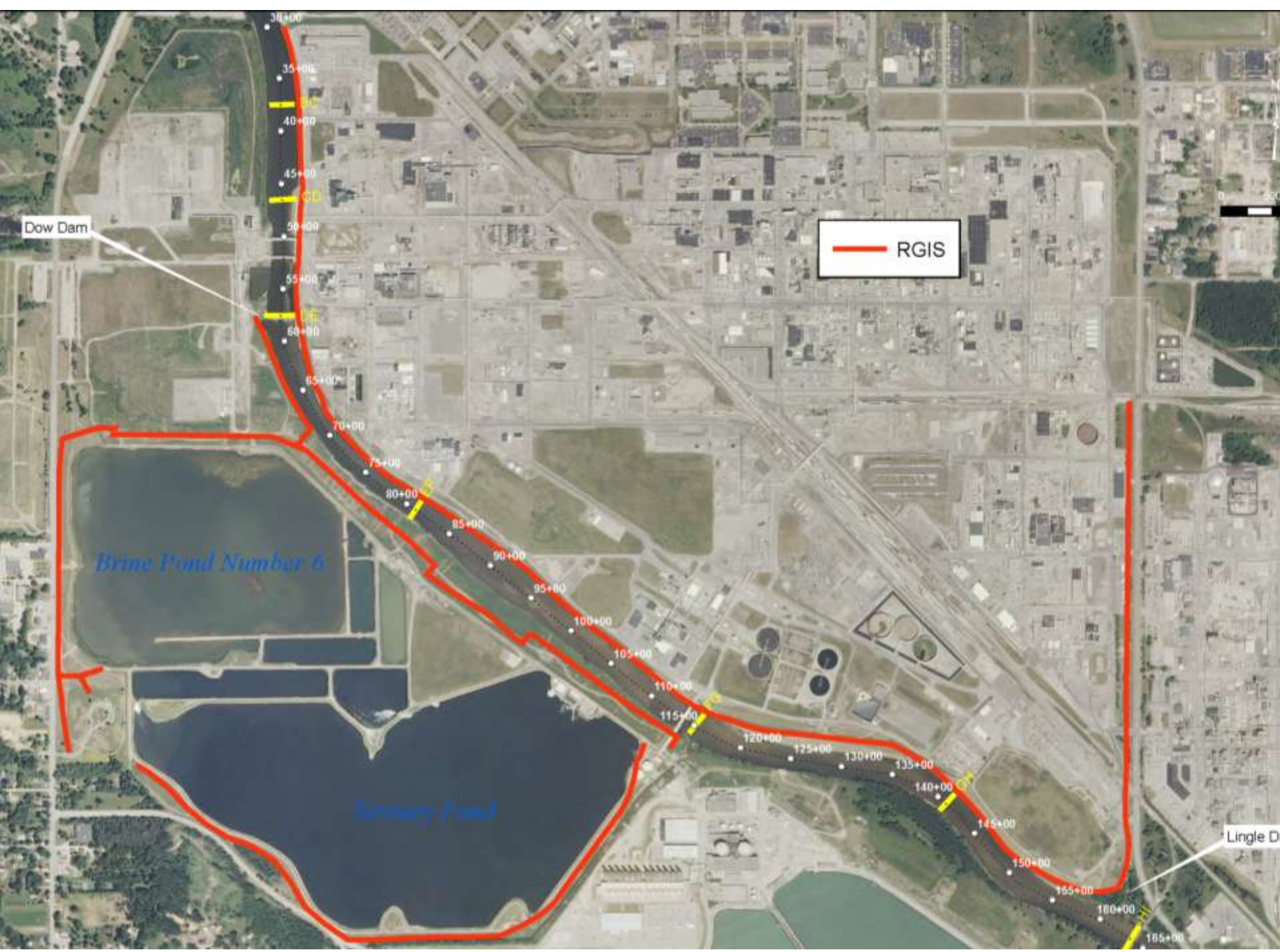
- Manufacturing operations have occurred nearby since the 1890s
- Contaminated sediment deposits due to historic releases
  - Discharge to the river – direct, holding ponds, outfalls
  - Surface water runoff
  - Groundwater
- Waste management systems and source controls now protect the river

Current Source Control



Groundwater Controls

- Plant groundwater is controlled by a system called the Revetment Groundwater Interception System (RGIS)
- RGIS intercepts plant groundwater that would otherwise go to the River
- Performance is continually monitored
- Need to consider RGIS in developing Segment 1 options


Dow Dam
RGIS
Brine Pond Number 6
Sanitary Pond
Lingle D
30+00
35+00
40+00
45+00
50+00
55+00
60+00
65+00
70+00
75+00
80+00
85+00
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140+00
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150+00
155+00
160+00
165+00

Near-Plant Actions Completed

- Significant cleanups in Segment 1
  - Address dioxin/furans and other chemicals
  - These completed actions help inform future actions in Segment 1
- Includes:
  - Reach B – Removal and capping
  - Reach D – Dredging, capping and monitored natural recovery
  - Reach G Sand Bar – Containment, groundwater capture and treatment

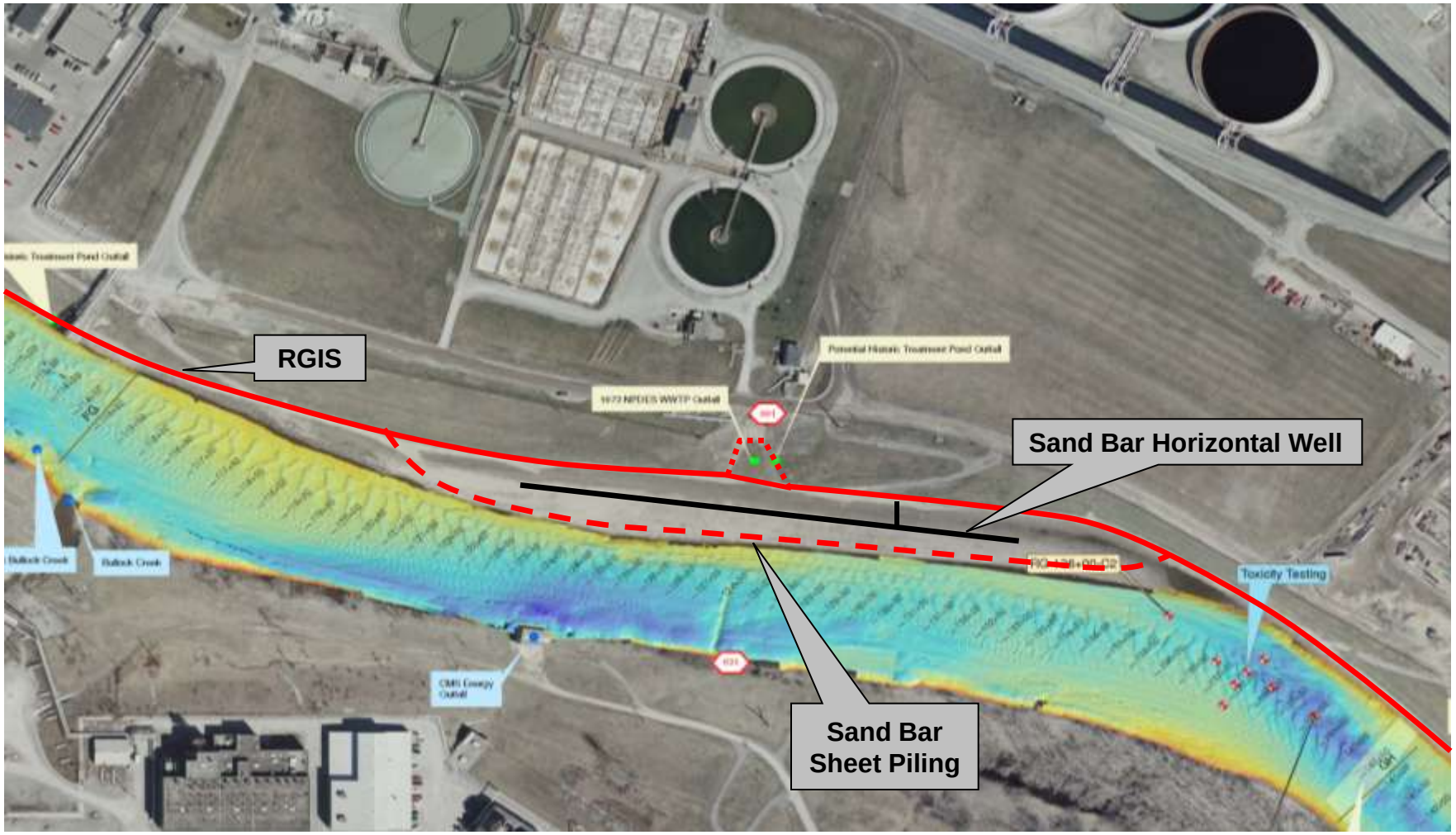
Reach G Sand Bar Source Control

- Dense Non-Aqueous Phase Liquid (DNAPL) discovered adjacent to a historic outfall on the inside of sand bar – 1997

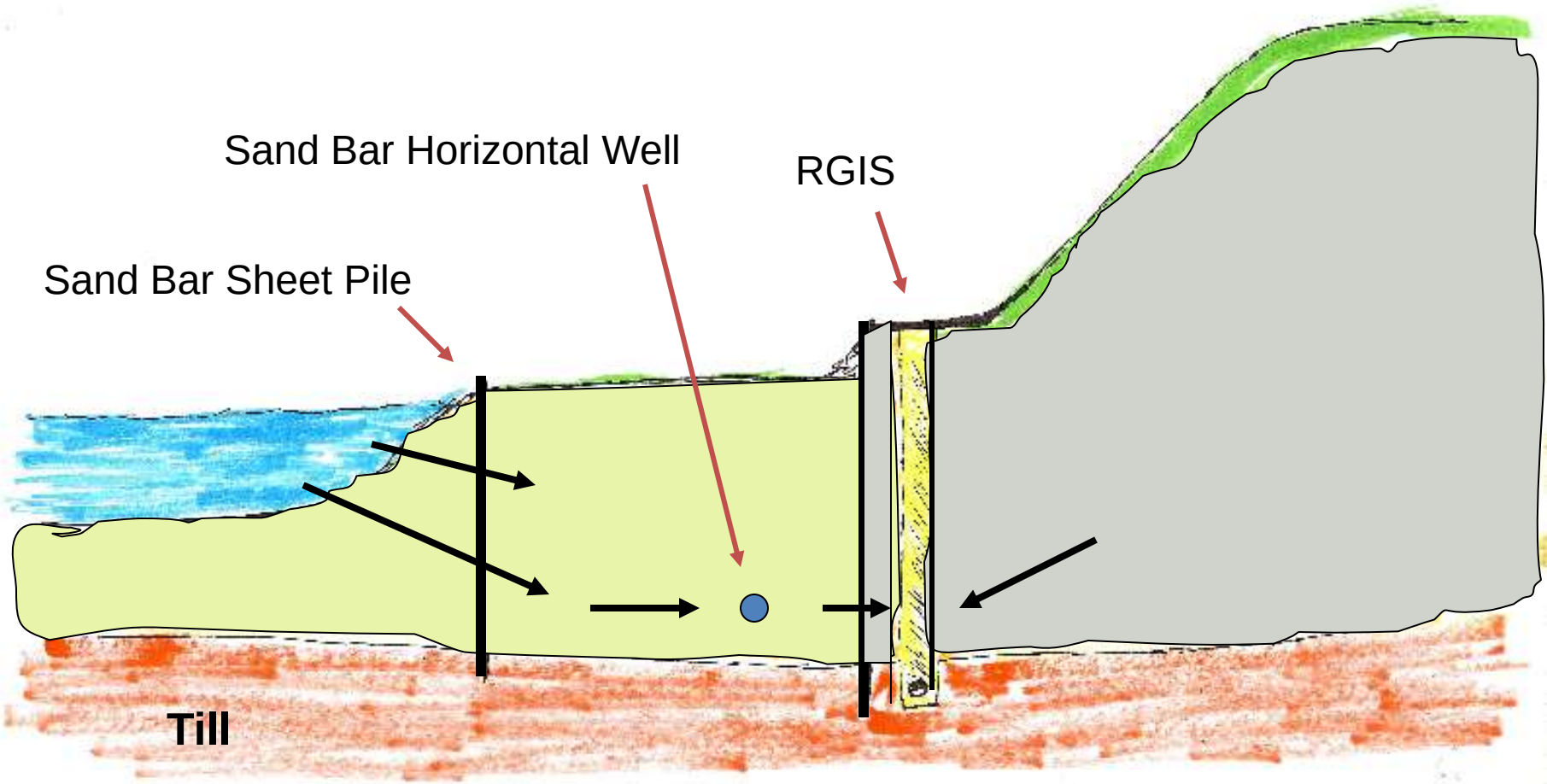
- Lateral hydraulic barrier/containment (sheet piling) was installed in 1998

- Single horizontal well for hydraulic control installed ~12 feet below ground surface within the sand bar

Sand Bar Area



Reach G Sand Bar Area



Summary of Segment 1 Conditions
Investigation Activities

Extensive investigations since 2006:

- Sediment sampling and analysis
- Sediment stability evaluations
- Biological evaluations
- DNAPL/product investigation

Summary of Segment 1 Conditions
Preliminary Findings

- Six chemicals/chemical groups identified as key drivers for Segment 1
  - Chlorobenzenes
  - Chlorophenols
  - Polynuclear Aromatic Hydrocarbons (PAHs)
  - Arsenic
  - Ethyl parathion
  - Ortho-phenylphenol

- These chemicals are not found everywhere and are not always found together

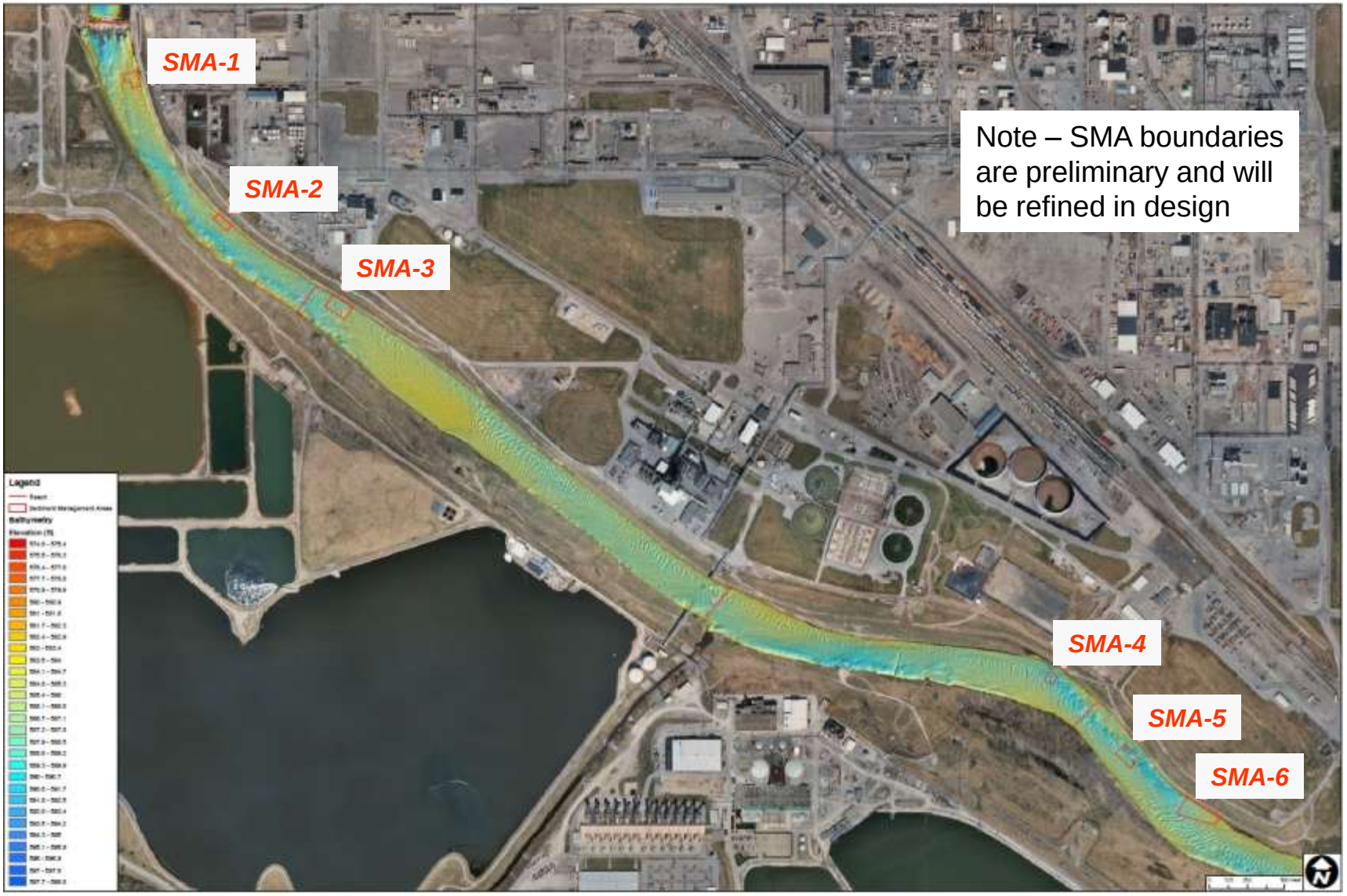
Summary of Segment 1 Conditions
Preliminary Findings (cont.)

- DNAPL/recoverable product found in some locations
- Dioxin and furans in Segment 1 were largely addressed by the actions in Reaches B and D
- Specific areas have been identified that will need cleanup options
  - Called “Sediment Management Areas” or “SMAs”
  - Evaluations are ongoing

Summary of Segment 1 Conditions
Preliminary Findings (cont.)

- Surface sediment concerns
  - Harm to small invertebrates (“benthos”) that live on the river bottom
  - Potential bioaccumulation
- Underlying sediment concerns
  - Potential erosion of cleaner surface that exposes buried contamination
  - Potential contaminant source

Segment 1 Sediment Management Areas



SMA CLEANUP OPTIONS

Segment 1 Potential Options

- Cleanup options will be developed for each Sediment Management Area in Segment 1
- Cleanup options being developed include:
  - Monitored Natural Recovery (MNR)
  - Removal
  - In-place isolation/containment (e.g., capping)
  - Treatment (see next slide)
  - A combination of these

Specialized Options for Segment 1

- Hydraulic containment – isolate area and remove and treat contaminated water through RGIS
- Product recovery – DNAPL would be removed and treated
- Specialty caps
  - Low permeability
  - Reactive caps that provide some treatment (e.g., organoclay, activated granular carbon)

SMA Groupings for Response Options

- The SMAs have been grouped for response option development because of similarities in conditions and appropriate response options

- Groupings:
  - SMA 1
  - SMAs 2 and 3
  - SMAs 4 and 5
  - SMA 6

SMA 1 Characteristics

- Concentrations greater than levels potentially toxic to benthos at 0 – 2 ft
  - Arsenic
  - PAHs
- Underlying sediment
  - Sediment thickness to till ~ 6 to 9 ft

SMA 1 Alternatives

- Alt 1: Monitored natural recovery
- Alt 2: In situ containment
  - Sand/gravel cap
- Alt 3: Removal of sediment
  - Sediment removal
  - Dewatering and landfill disposal
  - Sand cover/backfill for residuals management, if needed

SMAs 2 and 3 Characteristics

- Concentrations greater than levels potentially toxic to benthos at 0 – 2 ft
  - SMA 2: chlorobenzenes , chlorophenols
  - SMA 3: chlorobenzenes, chlorophenols, PAHs, ortho-phenylphenol
- Sediments containing potentially recoverable product overlie till
  - Sediment thickness to till: up to 3.5 ft in SMA 2 and 6.2 ft in SMA 3
  - Site characterization and product recovery pilot testing suggests that there is the potential for recoverable product

SMAs 2 and 3 Response Alternatives

- Alt 1: In situ containment with hydraulic control
  - Lateral containment barrier (sheet piling)
  - Low permeability cap
  - Passive hydraulic control through RGIS
- Alt 2: Product removal/treatment and in situ containment with hydraulic control
  - Same as Alt 1 for containment
  - Removal and treatment of recoverable product
  - Active hydraulic control and treatment through RGIS
- Alt 3: Removal of sediment and post-removal residuals management
  - Sediment removal
  - Dewatering and landfill disposal
  - Reactive (e.g., organoclay) cap for residual management

SMAs 4 and 5 Characteristics

- Concentrations at 0 – 2 ft are not expected to be toxic to benthos
- Subsurface contaminants/sheen identified above till (mostly chlorobenzenes)
  - Sediment thickness to till: up to 6.5 ft in SMA 4 and 3.1 ft in SMA 5
  - Site characterization and product recovery pilot testing suggests that recoverable product is not present

SMAs 4 and 5 Response Alternatives

- Alt 1: Monitored natural recovery
- Alt 2: In situ containment
  - Erosion protection layer to ensure long-term isolation
- Alt 3: Removal of sediment
  - Sediment removal
  - Dewatering and landfill disposal
  - Sand cover/backfill for residuals management

SMA 6 Characteristics

- Only one nearshore sample greater than levels potentially toxic to benthos at 0 – 2 ft : Ethyl parathion (EP)
- Cleaner sediments overlie deeply buried chlorobenzene deposits
- Subsurface contaminants and product identified above till at ~9 ft (mostly chlorobenzenes)
- Site characterization and product recovery pilot testing suggests that recoverable product is present

SMA 6 Response Alternatives

All – Removal of nearshore surface sediments for EP

- Alt 1: Product removal/treatment and MNR of remainder of SMA
  - Removal and treatment of recoverable product
- Alt 2: Product removal/treatment and in situ containment with hydraulic control of remainder of SMA
  - Removal and treatment of recoverable product
  - Lateral containment barrier
  - Low permeability cap
  - Active hydraulic control and treatment through RGIS
- Alt 3: Removal of sediment
  - Sediment removal
  - Dewatering and landfill disposal
  - Backfill or cap (potentially reactive cap) for residual management

Common Elements of all SMAs

- Continued assurance of source control
- Dewatering and water/product treatment performed as practicable at the Dow facility
- Disposal of materials at approved site(s)
- Construction and post-construction monitoring
- Operation & Maintenance, including O&M of Reach B and D caps
- Remedial Design evaluations, including delineation of footprint and additional product recovery investigation

EPA Policy Statements on Remedy Selection… (2005 Guidance)

- There is **no presumptive remedy** for any contaminated sediment site, regardless of the contaminant or level of risk

- Generally, dredging, capping and monitored natural recovery (MNR) or a combination of approaches should be evaluated at every site
  - These are all being evaluated for Segment 1

EPA Policy Statements on Remedy Selection… (cont.)

- Both in-place and removal approaches may reach acceptable levels of effectiveness and permanence, depending on site conditions

- Must consider **risk reduction**:
  - Associated with reduced exposure to contaminants
  - Must consider risks introduced by implementing alternatives
  - Mass removal does not necessarily equate to risk reduction

Upcoming CAG Topics – Segment 1

Over the next few months, we would like to discuss:

- Advantages and limitations of cleanup options that best fit the environmental conditions in Segment 1
- EPA's preferred options
  - Effectiveness
  - Implementability
  - Cost

QUESTIONS?